



Changes in learning styles induced by practical training

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ABSTRACT

In medical schools the learning environment changes from scholastic to teaching-on-the job during clerkships. Alterations in learning style during clerkships were studied and are reported. This study investigated whether practical training results in alterations in learning style and whether later career preference was related to learning style. Prior to and at the end clerkship students filled in a learning style inventory based on Honey and Mumford. One-hundred-twenty-seven students at the start and 189 at the end of clerkships were included. Activists were found to be predominant. Pragmatists were scarce. At the end of clerkships a reflective orientation emerged. Prior experiences resulted in higher activists' scores; the effects disappeared later on. Later career choice was of major influence in respect to extend of pragmatism, reflective observation and concrete experience. It can be concluded that in medical students initially a more activist learning style is seen. A more reflective style develops during the clerkships. An initial effect of former experiences disappears. Clerkships add to the individual repertoire of learning style/personality features. Differences related to career preference persist. The influence of vocational training on learning style as related to later foreseen medical career is limited.

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1. Introduction

The basic type of learning of an individual is indicated by the term learning style. Hilliard defined learning style as follows "A predisposition on the part of a student to adopt a particular leaning strategy regardless of the specific demands of the learning task" (Hilliard, 1995). Learning styles are related to various approaches or ways of learning. They are also related to preference of educational methods, on basis of which optimization of learning for a specific individual can be achieved.

Common categorization of the learning style classifications is cognition-centered, learning-centered and personality-centered learning styles (Sadler-Smith, 1999). Learning styles based on direct experience are denominated as experiential learning styles and involve the process of making meaning from direct experience. Learning style inventories are classified on basis of stability (Coffield, Hall & Ecclestone, 2004). The styles mentioned under experiential learning belong to the group of "flexibly stable learning preferences". This indicates that learning styles within this group tend to adapt slowly to experiences.

In many medical curricula the first years focus on the cognitive aspects and acquisition of technical skills. During practical training (i.e., clerkships) the learning environment changes often dramatically from rather scholastic to "teaching on the job". As a result learning gets heavily influenced by experience. Non-cognitive objectives are addressed more extensively in this second period. As a result it is likely that the learning style of students can change during this

prolonged (in most medical schools at least 2 years) period of practical training (Volet, Renshaw, & Tietzel, 1994). To investigate experiential learning styles the inventories of Kolb and Honey & Mumford are suitable (Honey & Mumford, 1982; Kolb, 1984). These inventories determine learning style and claim to predict behavioral choices an individual tends to make. The tests measure the four modes of the learning process: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC) and active experimentation (AE). CE and AC are considered to be contrasting, the same holds for AE and RO. After putting them in a diagram four basic learning styles are discerned by Kolb. In Honey & Mumford's concepts learning styles are highly in line with these mentioned styles, but different names are given; activist, reflector, theorist and pragmatist (Honey & Mumford, 1982). The resulting scheme is depicted in Fig. 1.

1. Accommodators (activist as denominated by Honey and Mumford) like to do things, carry out plans and tasks and like to be involved in new experiences. They learn best when they are in involved in new experiences, problems and opportunities, working with others in business games, team tasks, role-playing, being thrown in the deep end with a difficult task, chairing meetings, leading discussions; they learn less when listening to lectures or long explanations, reading, writing or thinking on their own, absorbing and understanding data, following precise instruction to the letter (Groat & Musson, 1996).
2. Divergers/reflectors emphasize concrete experiences and reflective observations; their strength lies in imaginative ability and awareness of meaning and values. They learn best when observing individuals or groups at work, they have the opportunity to review what has

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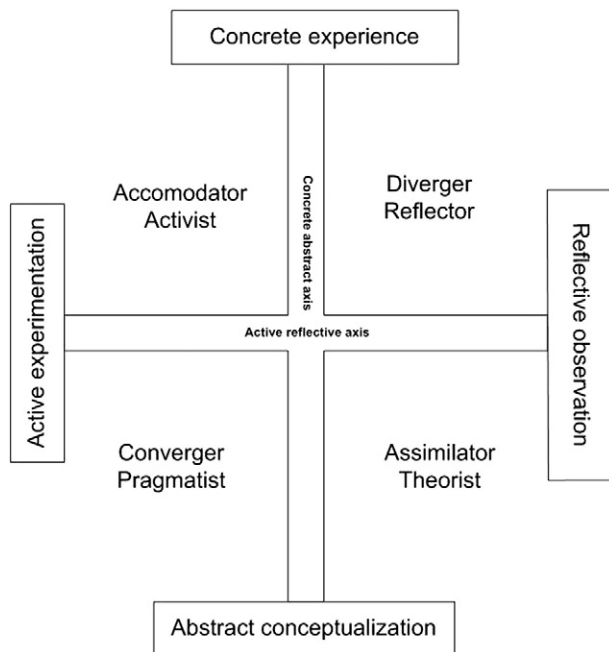


Fig. 1. Schematic representation of learning modes and the resulting learning style.

happened and think about what they have learned, producing analyses and reports doing tasks without tight deadlines. Reflectors learn less when: acting as leader or role-playing in front of others, doing things with no time to prepare, being thrown in at the deep end, being rushed or worried by deadlines.

- Assimilators/theorist prefer inductive reasoning and ability to create models are major capacities. Theorists learn best when: they are put in complex situations where they have to use their skills and knowledge, they are in structured situations with clear purpose, they are offered interesting ideas or concepts even though they are not immediately relevant, they have the chance to question and probe ideas behind things. Theorists learn less when: they have to participate in situations which emphasize emotion and feelings, the activity is unstructured or briefing is poor, they have to do things without knowing the principles or concepts involved, and they learn less in case they feel to be out of tune with the other participants e.g., with people of very different learning styles.
- Strength of convergers/pragmatists lies in problem solving, decision making and practical application of ideas. They learn best when there is an obvious link between the topic and job, they have the chance to try out techniques with feedback e.g., role-playing, they favor techniques with obvious advantages e.g., saving time, they are shown a model they can copy e.g., a film or a respected boss. Pragmatists learn less when: there is no obvious or immediate benefit that they can recognize, there is no practice or guidelines on how to do it, there is no apparent pay back to the learning e.g., shorter meetings, and the event or learning is 'all theory' (Kolb, 1984).

This report describes the investigations on changes in learning style induced by clerkships in a medical school.

2. Aims of the study

Two primary research questions were formulated: 1. Does the change from theoretical learning to practical training result in alterations in learning style? and 2. Is later career preference related to learning style?

3. Method

3.1. The inventory

Learning styles were tested using the 40-item inventory used at the Centre for Postgraduate Training of the University of Amsterdam. The test is the translation into Dutch of the inventory of Honey and Mumford (1986). The inventory of Honey & Mumford was extensively reviewed in respect to reliability and validity by Coffield et al. (2004). Additional questions inquired for age, gender, interval between high school and start of medical school, year of start of the medical school, start of clerkship and preference for a specialty after MD-certification. The numbers of positive answers obtained resulted in figures for the four domains of the learning style. As indicated by Kolb and Honey & Mumford a simple classification according to the highest score is not preferred and the data considering each category should be made (Honey & Mumford, 1982; Kolb, 1984). Since the scoring of Honey & Mumford results in preference levels, the resulting figures reflected the following levels 0–1.0 very low preference, 1.1–2.0 low preference, 2.1–3.0 moderate preference, 3.1–4.0 strong preference, and 4.1–5.0 very strong preference (Honey & Mumford, 1986). For identification of the learning modes, i.e., reflective observation versus active experimentation, the added results for activists and pragmatists styles were subtracted from the added results for reflectors and theorists. For identification of modes in respect to concrete experience versus abstract conceptualization the added results of theorists and pragmatists were subtracted from the added scores for reflectors and activists.

3.2. Students

All 127 students entering their first clerkship received the questionnaire at the start of their first clerkship. These students had finished their theoretical training of 4 years. They only incidentally had earlier patient contacts. In the same period another cohort of all 189 students who ended their clerkships were sent questionnaires. Duration of the clerkship period was similar for all students. Questionnaires were eligible for analysis if all 40 questions, needed to score the learning style, were answered.

3.3. Data analysis

The collected data were entered in an Excel© database and transferred in a SPSS© database and analyzed using SPSS© release UK 10.0: chi-square test, *t*-test, ANOVA, GLM-multivariate analysis, and Pearson's correlation.

3.4. Results

From the 316 questionnaires 70 (55%) students starting their clerkships and 67 (34%) of the students ending clerkships returned the questionnaire. By chi-square testing a gender-based bias related to selective returning of questionnaires was ruled out. Since we had no data on the age of the students not returning the questionnaire a bias in respect to age could not be ruled out. However, the difference in mean age between the cohort starting and the cohort ending clerkships was similar to the cumulative length of all clerkships. Mean ages of female students were 0.7 years less if compared to male students (not significant, chi-square). Ninety-one students indicated that they did not start medical school directly after secondary school. The interval varied from one to five years (mean 2.2 years). Eighty of them indicated to have done another study; the remainder had been employed. Interval was strongly correlated with age (Pearson's $r = 0.487$, $p < 0.001$). In respect to later career preference five categories could be constituted: internal medicine and its sub-specializations (30 students), surgery and sub-specializations ($n = 23$), pediatrics ($n = 20$), general practice ($n = 11$) and other specializations ($n = 53$).

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